2012

SOLAR POWER MICRO-INVERTER

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KAIDENG ENERGY

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System function

- **Power line carrier-current communication**

  By using electric power as a carrier of AC alternating current, can modulate high-frequency and carrier frequency (60KHz) in AC wire transmission and can achieve the communication/ newsletter between inverters or between inverter and computer. And it can transfer the power data and the brightness date of the sunshine in the real-time. Also monitor all functions of inverter.

  1. Carrier frequency：60KHZ（Frequency customizable）
  2. Interface way：TTL level serial interface
  3. Carrier rate：300BPS
  4. Serial rate：9600BPS（Can customize according to customer's request）
  5. Modulation mode：FSK+DSSS
  6. Newsletter distance：400m

- **6-grade power search**

  In overcast weather, the solar battery's output current is extremely tiny, then inverter will automatic open 6-grade power search function.

  1. The program can automatically open power adjustment for 6 times.
  2. The current direction can adjust from the maximum to the minimum.
  3. In automatic adjustment process, we will see the LOW light flashing. And the power will keep as a starting point, from 0 to the maximum output power, and it will restart at most for 6 times, then locked in the maximum power, the ST lamp long bright.
  4. It need 10 minutes for 6-grade power search.

- **Wide voltage input(22-50VDC）**

  Achieve wide voltage input.

  1. DC voltage input：22-50VDC
  2. Second level power variable voltage conversion

- **High-frequency two-way and one-way grid function**

  1. High frequency direct modulation, AC half wave synthesis
  2. Two-way grid means: Load consume directly. And can reverse AC current transmission.

- **Kinds of frequency output function.**

  1. It can apply to 50Hz and 60Hz frequency of AC.
  2. Frequency range: 48Hz ~ 63Hz

- **directly connected to the solar panels (do not need to connect the battery)**

  Using precise Dynamic differential pressure type MPPT function, APL functions, the inverter automatically adjust the solar panels of maximum output power，simply connect the solar panel to the grid inverters. Do not need to connect the battery.

  1. Differential pressure type MPPT: 0.1 V accuracy
  2. Power lock: 10W (AC output)

- **AC 0 angle with high precision auto-detection**

  AC phase angle of 0 through isolation amplifier then input to the MCU for high-precision detection and analysis. The phase shift rate is less than 1%, thus achieve high-precision with phase modulation AC output together.

  1. AC phase shift: < 1%
  2. Over-zero protection: 0.2 VAC
  3. AC switching: 50Hz / 60Hz

- **Synchronous High-frequency Modulation**

  In the process of the grid, usually adapt the same phase angle in parallel. (ie, When the two-phase alternating current total is equal to 0.Use switch to combination the two AC fusion) and the product is rectified AC half-frequency AC to 100Hz first, then the machine use the high frequency current in the circuit and semi-100Hz frequency alternating current generated combination, to achieve high-frequency modulation.

  1. Modulation synthesis: half wave and full-bridge modulation synthesis (100Hz / 120Hz)
  2. Synthetic way: MOSFET full-bridge
  3. High frequency: 50KHz

- **Pure Sine Wave Output**

  Use SPWM directly to make pure sine wave output.

  1. Output waveform: Adopt complementary PWM to push-pull pure sine wave.
  2. Generate means: enhancement-mode SPWM

- **Automatic Sensing Function Solar Luminosity**

  Use the latest luminosity perception operation technology. The different illuminate angle and intensity of the solar panel will produce different current output. Use advanced CPU to operate the different intensity of illumination.

  1. Luminosity sampling point ： power sampling point
  2. High precision AD sampling: integral AD sampling method

- **Power Automatically Locked (APL)**

  In different current fluctuations, we should use the MPPT function. When the MPPT function adjusted to the maximum power point, the product automatically powers locked in maximum power point, then made the output power more stable.

1. Power lock: The biggest sampling point of MPPT.

◆ **Automatically Adapt To Different Load**

Adapt to any of the power load.

◆ **Constant Current, Constant Power**

This product is constant current, constant output power, without any overload, over-current phenomenon.

◆ **Automatically Shut Down When The Power Grid Fault**

When the city power system is in failure, the inverter will automatically turn off the output.

1. Current Limit Protection
2. Current limit

◆ **Stack Multiple Machines**

Multiple small power inverters in parallel can achieve large output power.

◆ **High-Frequency High Conversion Rate**

Adapt high frequency converter, the output more efficient.

◆ **Maximum Power Point Tracking (MPPT)**

Because the current intensity and the voltage changes at any time, if there is no power point tracking, there will be a lot of problems. In the past time, usually adopt a solar controller, but this product uses high-precision (MPPT) operation power, automatic and immediate adjust the solar panels output power at the maximum output point, then achieve a stable output purposes. MPPT is for short of "Maximum Power Point Tracking". It means the controller can sense the voltage of the solar panels on time, and can track the highest voltage and current (VI).Then made the inverter discharge to power grid with the highest efficiency.

The peak voltage (Vpp) of the solar panels is about 38V when it in factory. And the environment temperature is 25 ° C. The reason of setting this temperature(interestingly, different from the subjective imagination, we ordinary people the conclusion may let us surprised) is that when the weather is very hot, solar panels' peak voltage will fall to about 36 V while in cold weather, the peak voltage can achieve 43 V.

Now we back to contrast the difference of MPPT solar energy grid inverter and traditional inverter. The traditional solar inverter is a bit like the manual gearbox. When the engine speed increase, while the gearbox gear don't increase at the same time, it will definitely affect the speed of the car. For traditional inverter speaking, the parameter output power is been set in factory. It likes a car have been fixed set on fixed 1 gears, no matter how powerfully you trample accelerator, the speed of a car is limited. While have the MPPT function it will be different, it is automatically. It will automatically adjust the gears according to the engine' speed, so it can make cars in the most gears in a reasonable efficiency standard operation. It means the MPPT controller can track the maximum power point of solar panels in real-time then express the biggest efficiency of solar panels. The higher the voltage, the more power can be output through the MPPT. Thus improve the charging efficiency. Theoretically speaking, using MPPT, the efficiency can be increased by 50% compared with the traditional inverter. But due to environmental impact and various around energy loss, the ultimate efficiency can improve 20%-30% according to our actual testing.

◆ **Stack using**

In order to achieve higher power use requirements, this product can be stacked. Such as: 4 micro inverter of 260W stacking can achieve 1040W. And the number of the stacking is unlimited.

◆ **DC input**

Input voltage range: 22V to 50V

Solar Panel: Recommend using the power more than 30W and the standard voltage of 36V PV panels.

Recommend using multiple solar panels. Solar panel in series will result in high-input voltage which will exceed the working voltage range of the inverter.

◆ **AC output**

Voltage range of the inverter whose output is 220V AC.: 190V - 260V，50HZ

Voltage range of the inverter whose output is 110V AC.: 90V - 160V，60HZ

---Please connect the inverter following the operation instruction show above. If have any question please contact with relative persons.

--- Non-professionals do not disassemble. Only qualified personnel may repair this product.

--- Please install inverter in the low humidity and well-ventilated place to avoid the inverter over-heating, and clear around the inflammable and explosive materials.

--- When using this product, avoid children touching, playing, to avoid electric shock.

--- Connected solar panels, battery or wind generators DC input DC power supply cable.

◆ Accessories for product

1. One warranty card
2. One user manual
3. One certificate of quality

Parameter table

models	WVC-260W-230V/50Hz/120V/60Hz
Recommend use solar panels	300Wpv
DC MAX input current	20A
AC MAX output power	260Watt
DC MAX Open-circuit input-voltage	100VDC
DC input voltage range	22~50VDC
MAX output power factor	0.99
DC input Reverse voltage protection	FUSE
AC output voltage range	（120V versions 90~160VAC）（230V versions 190~260VAC）
AC frequency range	48~63Hz
Output current total harmonic distortion	THDIAC <5%
AC Phase	<0.5%
Islanding protection	VAC；fAC
Output short circuit protection	Current-limiting
Show	LED mode power instruction voltage instruction AC frequency instruction over-voltage instruction
Communication way	60KHz modulation，power line carrier-current communication
Standby Power	<1W
Night Power	<1W
Ambient temperature range	-25 ℃~60℃
Humidity	0~100%(Indoor Type Design)
Waterproof	IP65
Electromagnetic Compatibility	EN50081.part1 EN50082.part1
Power System Disturbance	EN61000-3-2 EN62109
Network test	DIN VDE 1026 UL1741
Certificate	CE

Packing and weight

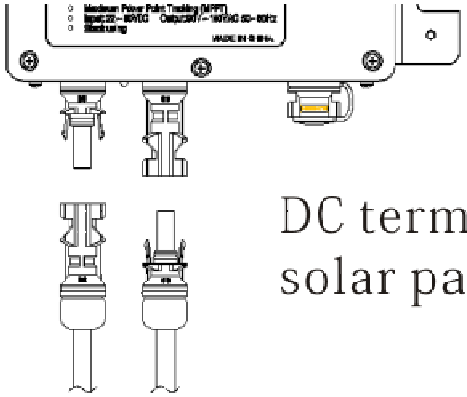
Net weight	0．83kg	
Gross weight	1.27kg	
Size (L x W x H)	191×176×38mm	
Package (L x W x H)	30x20.5x11.5CM	Big box: 42x31.5x36.5CM
Installation	Back of solar panel	

Operation Instruction

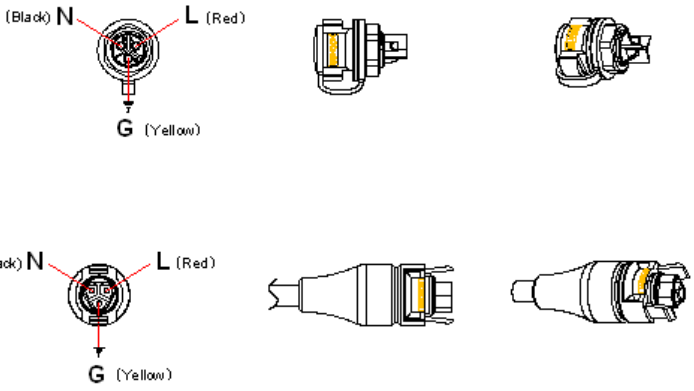
1. Use the 4*10mm screws to fix the inverter on the holder of the solar panel. Show below:

Kaideng New Generation Micro Inverter
★ New appearance more beautiful
★ New structure more efficient.
★ New installation more simple.
★ New connection more professional
★ New communication module more controllable
Micro Inverter

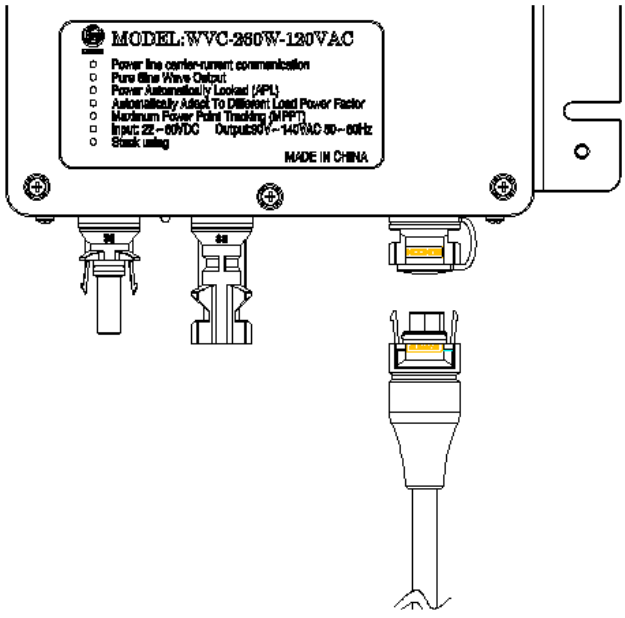
2. Connect the two DC terminal of the PV to the inverter, positive to positive, negative to negative. Show below:



3. Connection of AC output, connect the AC wire to the AC waterproof plug. Show below:



4. Connect the AC plug to the inverter's AC terminal. Show below:



LED display

Finished all the connections, confirm the AC and DC connection is right. The LED is red when the AC power is unconnected and the LED shows like below when the AC power is connected. The LED shows like below:

A) Power failure display

LED in red:

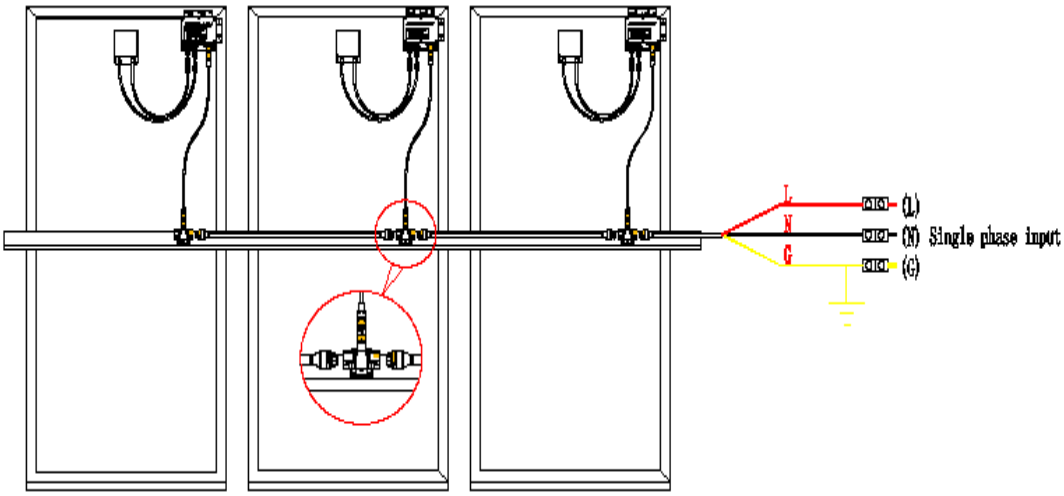
1. Power cut off
2. Output failure
3. Power grid fault
4. DC low- voltage display(protection)
5. DC over-voltage display(protection)
6. Over temperature display(protection)

B) Power adjust display

1. LED in green, but flashing, it means power is in adjusting condition.
2. LED in green and steady, it means the power is locked, and the inverter works.

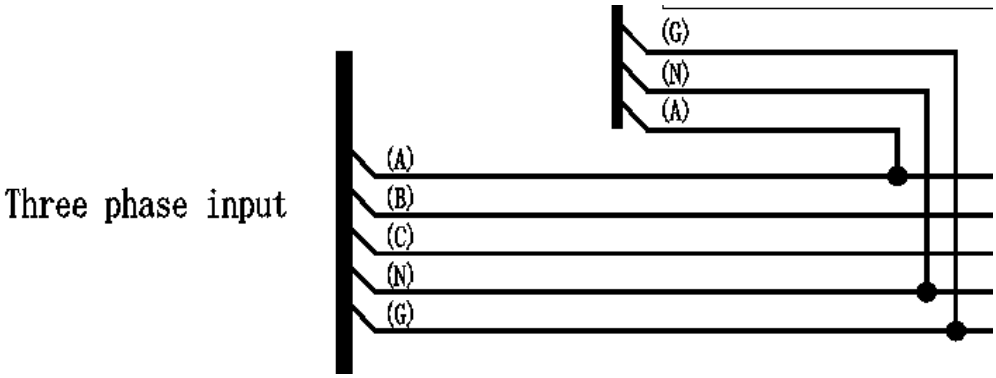
3. Single-phase connection

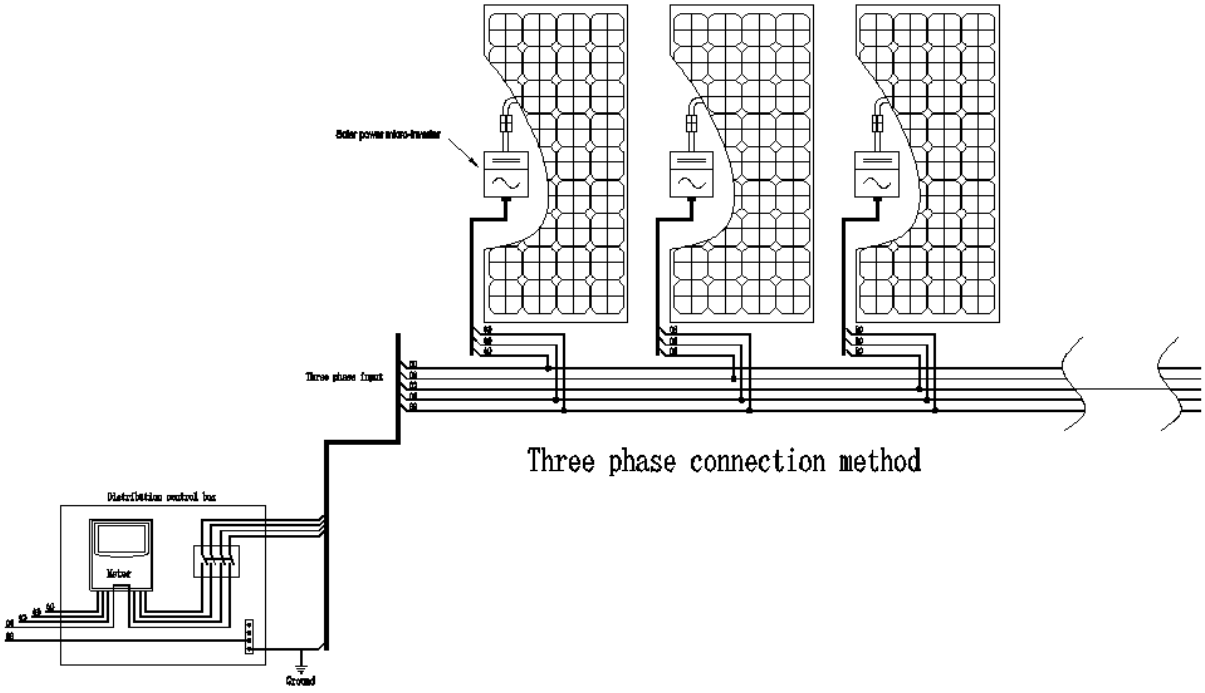
4. Connection electrical diagram of the solar inverter used in single-phase power generation system, show below



Three-phase connection

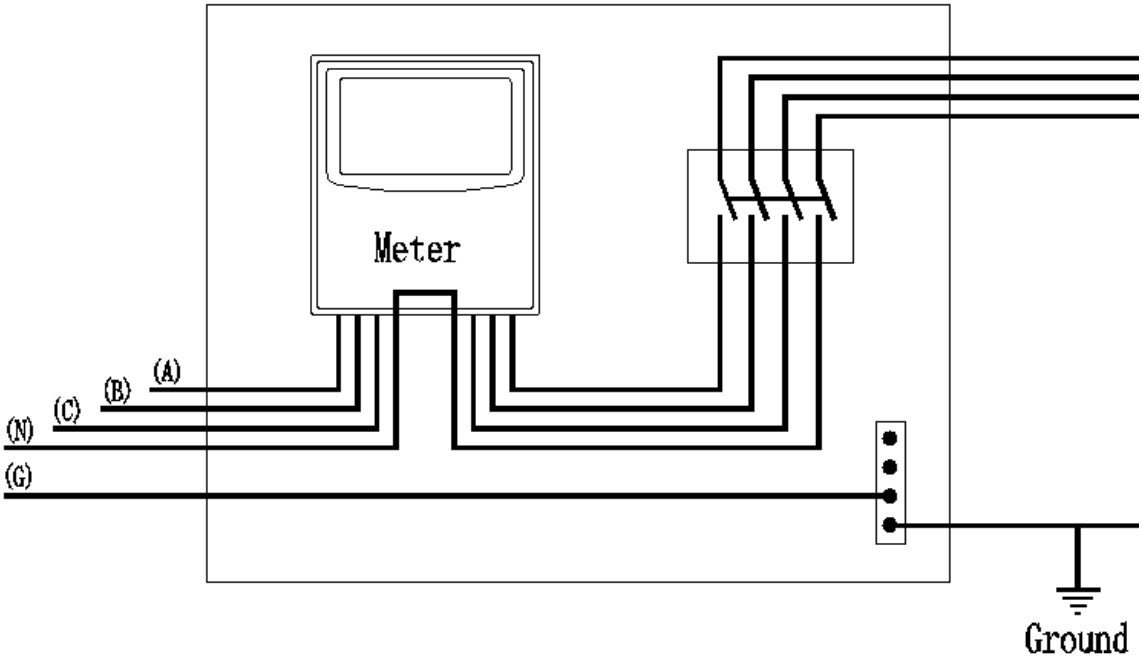
Connection electrical diagram of the solar inverter used in three-phase power generation system, show below





Three phase connection method

Distribution control box



- **Laboratory test results and waveforms**

The following figure shows the grid voltage, grid current, system transfer and island transportation MPP voltage waveform. In the following oscilloscope images, waveforms' color and have the following meanings:

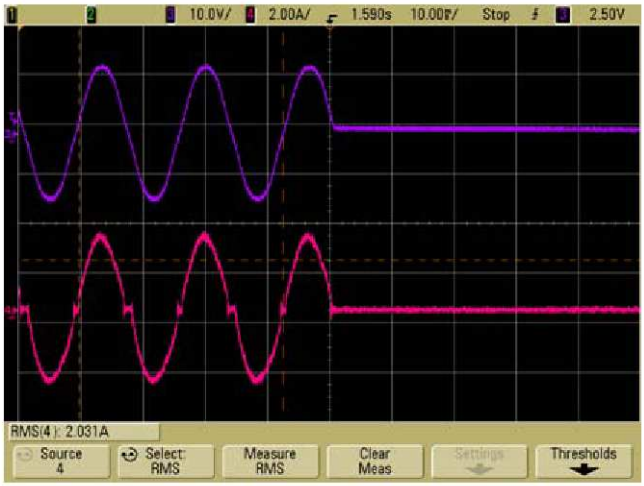
CH1 = yellow color is the solar micro-inverter input voltage ·

CH2 = green color is the solar micro-inverter input current

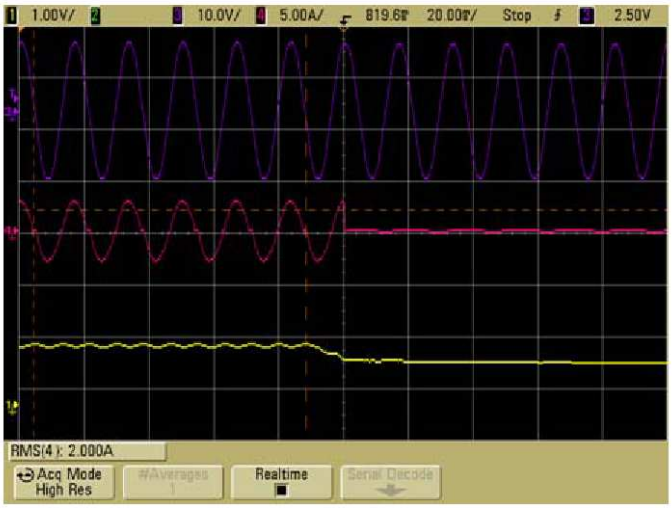
CH3 = purple color is the power grid voltage

CH4 = magenta color is the power grid current

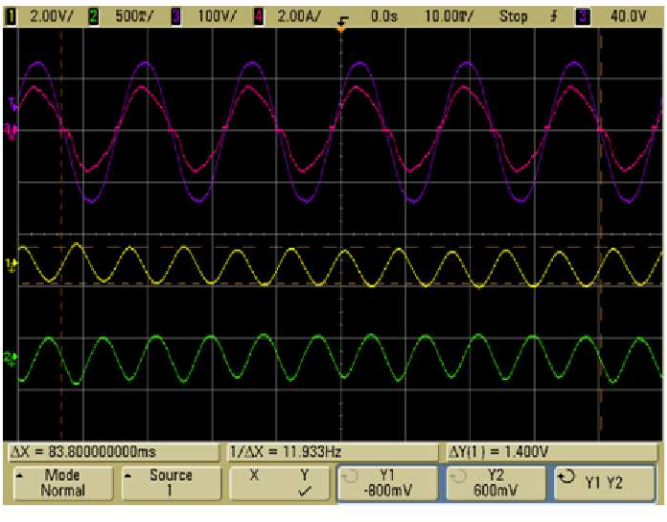
System islanding operation: When the AC voltage power grid in the zero value at the failure of the system shut down



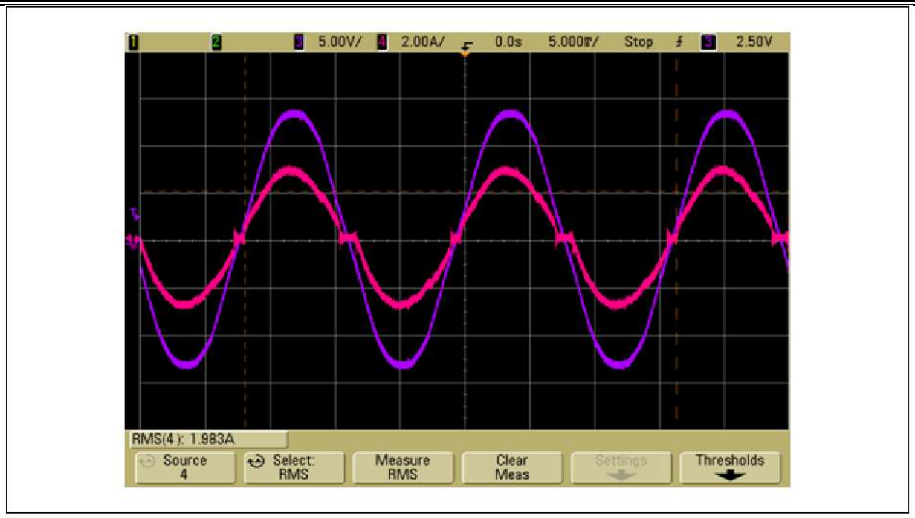
Night mode: When the input voltage is less than the low-voltage threshold, the system shut down



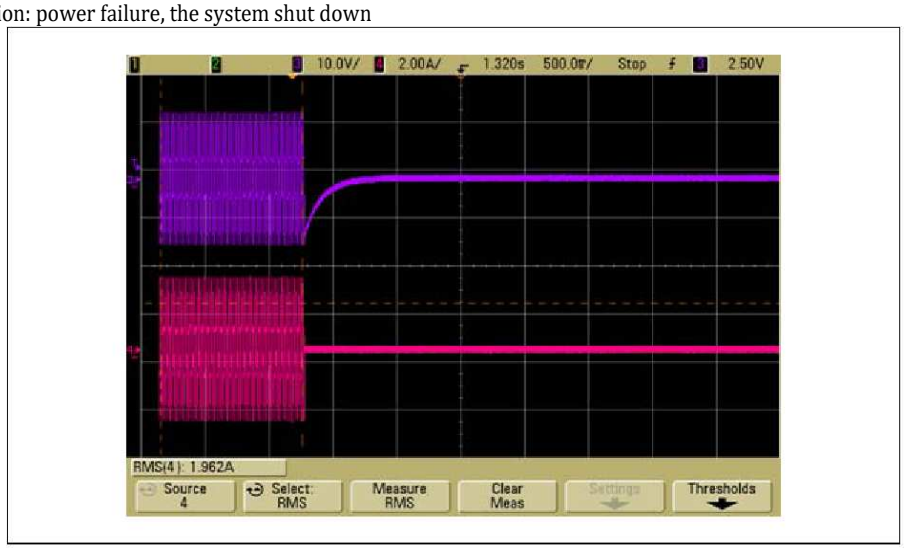
PV panels voltage ripple and current ripple



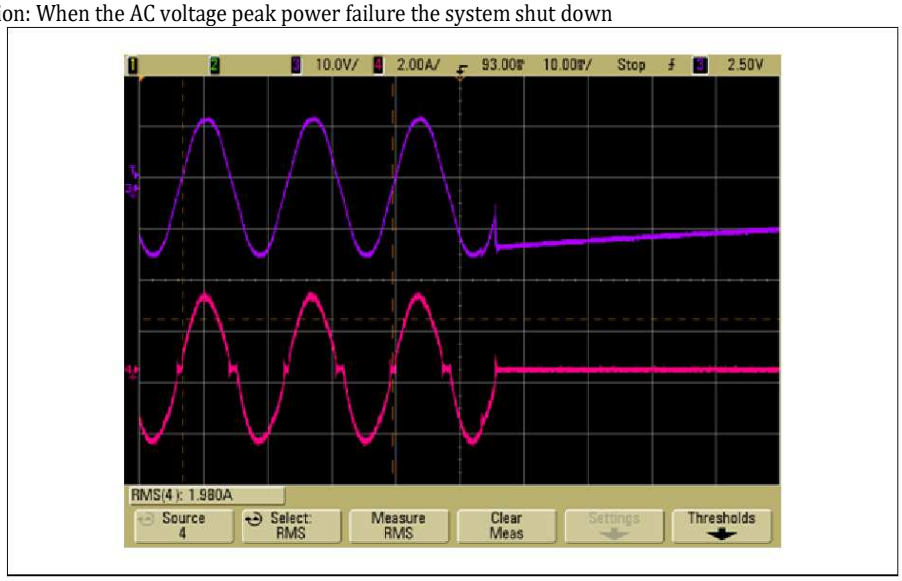
Grid voltage and grid current



System islanding operation: power failure, the system shut down



System islanding operation: When the AC voltage peak power failure the system shut down



KaiDeng new generation communication PV micro inverter generation system Introduction

KaiDeng new generation communication PV micro inverter generation system is a new intelligent power generation system which is invented to adapt to more and more variety generation applications. This system not only has the traditional functions of easy installation, low cost and high efficiency but also have the new solutions to solve the difficult to monitor and. The system uses the low cost power line communication technology to achieve long-distance communication and uses the relay data collector (WVC Modem) to achieve micro inverters centralized monitoring management. Then use KaiDeng power generation system to monitor all the inverters by PC within 24-hour and with low cost maintenance.

There are three main components in KaiDeng new generation system:

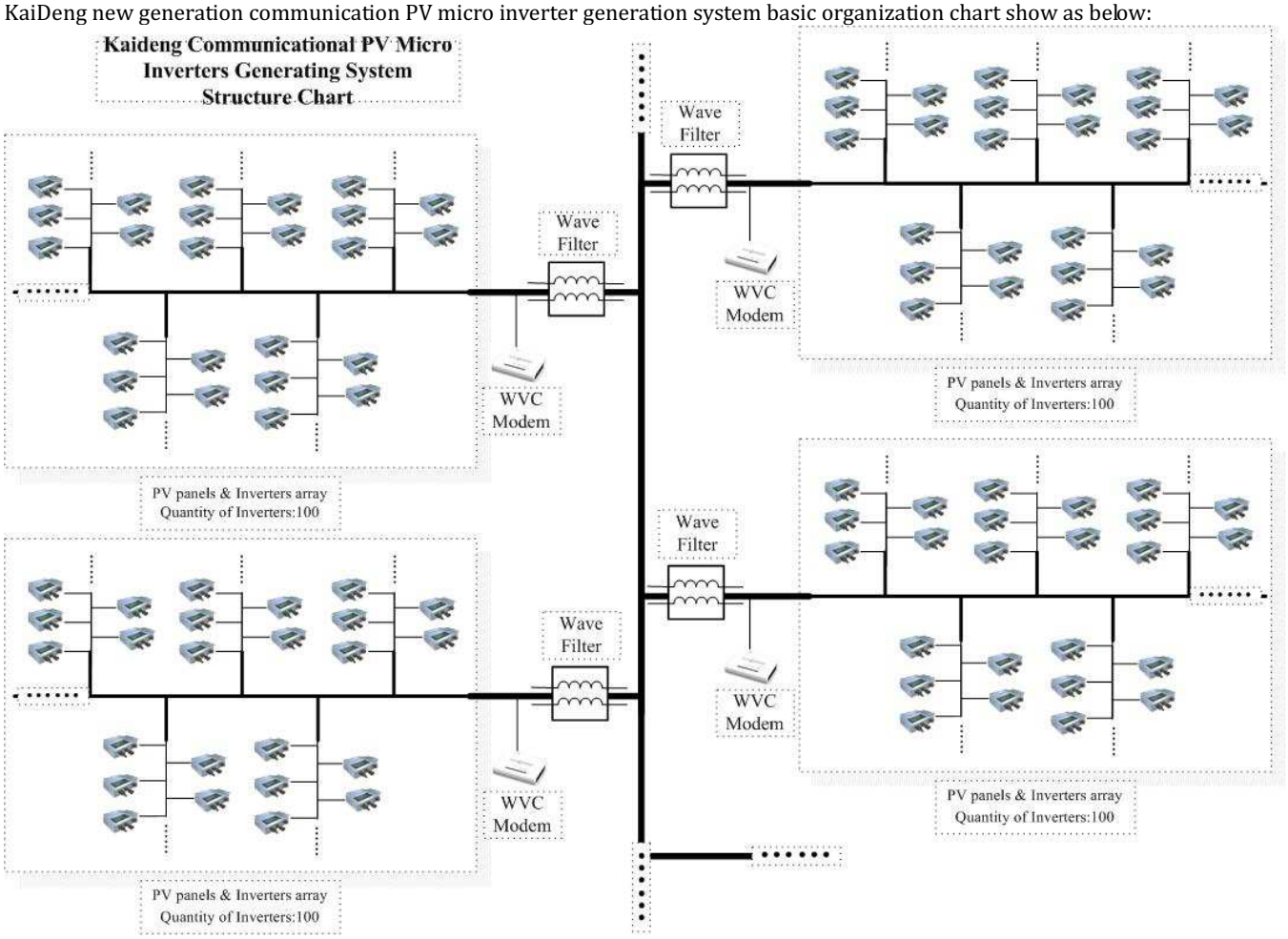
1.KaiDeng WVC micro Inverter;

2.KaiDeng WVC Modem;

3.KaiDeng Power Monitoring System.

KaiDeng WVC Modem and KaiDeng Power Monitoring System must used together with KaiDeng communication micro inverter. They are not universal product, specially design for KaiDeng communication generation system.

KaiDeng new generation communication PV micro inverter generation system basic organization chart show as below:



System basic operation parameter:

1.One WVC Modem can manage and monitor 100pcs of micro inverter;

2.One computer can connect 255pcs of WVC Modem;

3.Take turns to refresh the screen data for each device every second;

4.Collect all groups data from WVC Modem every minute;

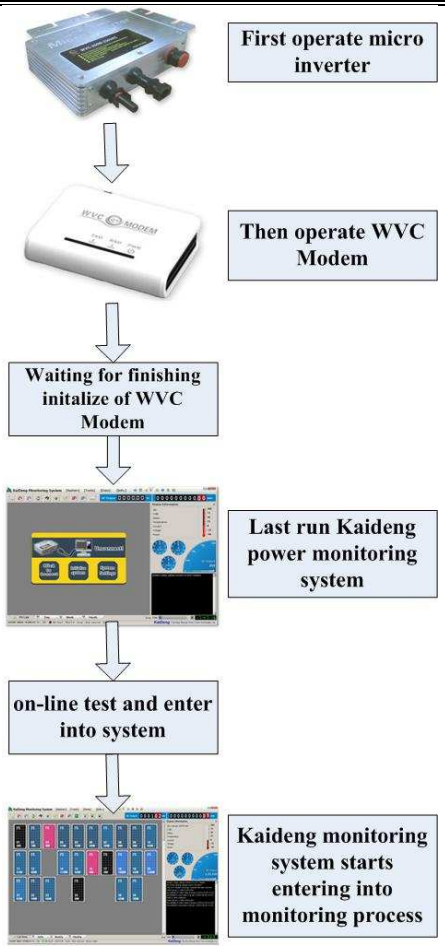
5.Save the present time generation data every 5 minutes;

6.Power lines carrier communication distance will be 400 meters;

System operation order explains:

In order to run the system fluently, please pay attention to the operation order. Wrong order may lead to not get the data in time and correctly.

The system operation order show as below:


First operate micro inverter
Then operate WVC Modem
Waiting for finishing initalize of WVC Modem
Last run Kaideng power monitoring system
on-line test and enter into system
Kaideng monitoring system starts entering into monitoring process

KaiDeng WVC Modem Brief Instruction

KaiDeng WVC Modem is the relay data collector which is special R&D for KaiDeng communication generation system. The communication between KaiDeng WVC Modem and micro inverters is achieved by power line carrier-current communication technology, then achieve the communication transmission with low cost. And the communication between WVC Modem and PC is achieved by normal serial port technology. It's also save the cost for users and decrease the difficult in application technology and installation cost at the same time.

KaiDeng WVC Modem makes the devices status monitoring, data collection and devices controlling together. It is easy to use and run automatically under right operation order. It can achieve 24-hour detection and control online. It's the best helper in PV generation's application and maintenance.

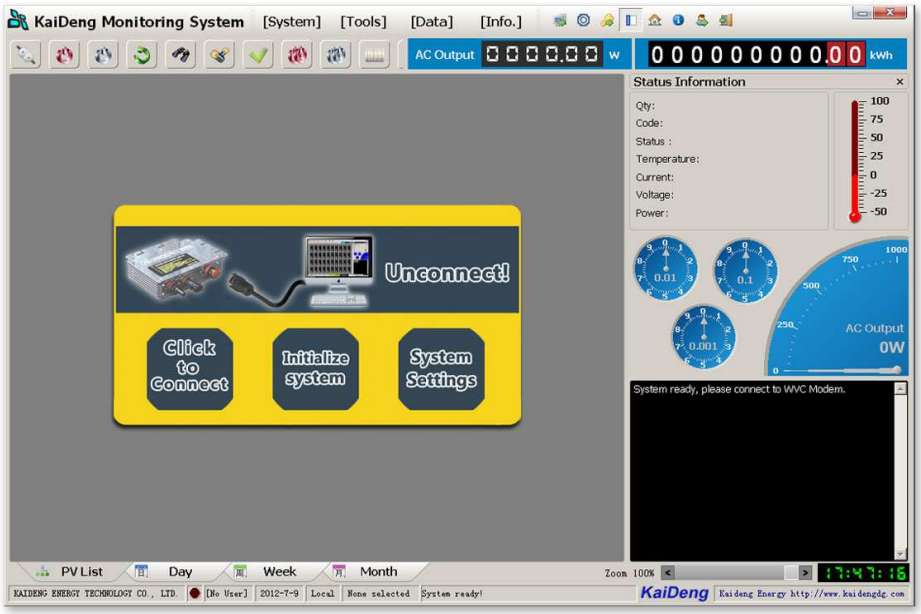
KaiDeng Power Monitoring system Instruction

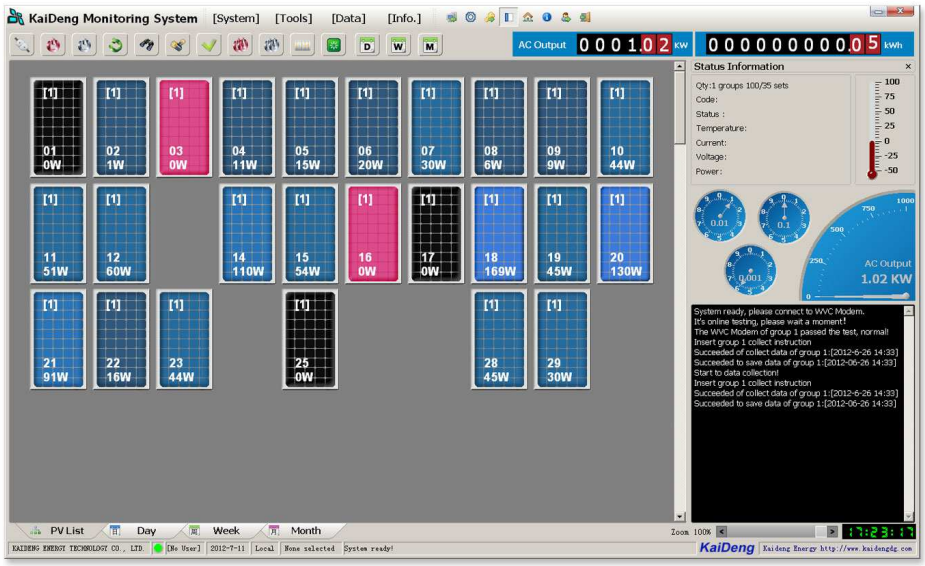
As KaiDeng's micro inverter and WVC Modem, KaiDeng Power Monitoring system is also the special power monitoring software for KaiDeng energy and with completely intellectual property rights. It's an important component in our new communication generation system.

KaiDeng Inverter Monitoring system is simple to install, which just take a few steps to finish and put it into operation. Cooperate with the WVC Modem, the system can be turned into high efficient application system immediately. It's very easy to operation KaiDeng Power Generation System. By using the system, users can detect the devices operation status at anytime and know the electricity of system. Also it can control operation and adjust the inverter' power. You can manage and maintain the system whenever and wherever in nightclothes at home.

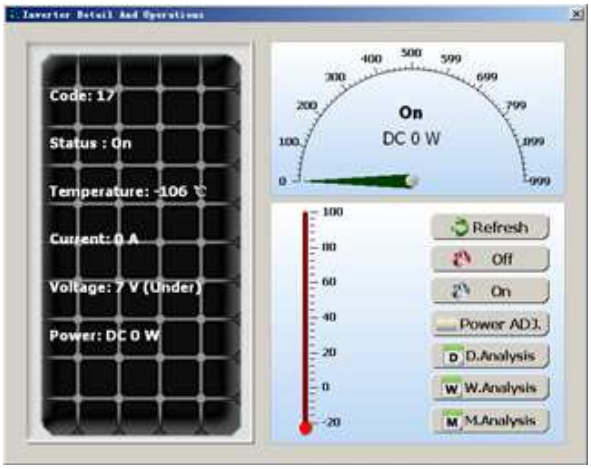
KaiDeng Power Monitoring system is an important component of KaiDeng generation system.

Main Form of Monitoring System:





Inverter Operation Status window:



Generation Analysis Curve: